CLAIMS (30895)

What is claimed is:

1. A method of wireless communication, comprising:

(a) estimating at least one eigenvector of a matrix of communication channel coefficients for a channel between a first plurality of antennas and a second plurality of antennas; and

(b) transmitting using said first plurality of antennas with the relative weightings of baseband signals on said first plurality of antennas corresponding to components of said at least one eigenvector.

2. The method of claim 1, wherein:

(a) said communication channel has MN coefficients, α_{ij} for i = 1,..., M and j = 1, ...N where M and N are positive integers, and α_{ij} relates to transmission from the ith antenna of a transmitter to the jth antenna of a receiver, and said matrix is CC^H where C is the M x N matrix with ith row and jth column entry α_{ij} and ^{H} is Hermitian conjugate.

3. The method of claim 2, wherein:

(a) said signals on said antennas are a superposition of first signals weighted according to a first eigenvector of CC^H plus second signals weighted according to a second eigenvector of CC^H wherein the superposition depends upon first and second eigenvalues of CC^H.

4. The method of claim 3, wherein:

(a) number of bits allocated between said first signals and said second signals depends upon the ratio of said first eigenvalue and said second eigenvalue.

5. A method of wireless communication, comprising:

(a) estimating eigenvectors of a matrix of communication channel coefficients between a transmitter with M antennas (M an integer greater than 1) and a receiver with N antennas (N an integer greater than 1); and

(b) transmitting on said communication channel baseband signals x1, ..., xK (K a positive integer) with the relative weightings of each of said signals among said antennas corresponding to components of a linear combination of said eigenvectors of said matrix;

(c) wherein said linear combinations of said signals maximize the minimum distance between received different signals at a receiver.

6. The method of claim 5, wherein:

(a) said communication channel has MN coefficients, α_{ij} for i = 1,..., M and j = 1, ...N, and α_{ij} relates to transmission from the ith antenna of a transmitter to the jth antenna of a receiver, and said matrix is CC^H where C is the M x N matrix with ith row and jth column entry α_{ij} and ^{H} is Hermitian conjugate.

7. The method of claim 5, further comprising:

(a) repeating step (c) of claim 5 for a plurality of distributions of constellations of symbols where each of said signals includes a symbol of a constellation as a factor for a corresponding linear combination; and

(b) using for said transmitting of step (b) of claim 5 the distribution of constellations and corresponding linear combinations from step (a) of this claim which has a largest maximum.

8. The method of claim 5, wherein:

(a) each of said linear combinations has a single nonzero coefficient with a one-to-one relation between said K signals and K of said eigenvectors.

9. A transmitter, comprising:

(a) antennas A1, ..., AM where M is a positive integer greater than 1;

(b) a channel analyzer coupled to said antennas and operable to estimate eigenvalues and eigenvectors of an M x M matrix derived from coefficients of a communication channel from said antennas to a receiver;

(c) a signal generator coupled to said antennas and to said channel analyzer and operable to apply signals S1, ..., SM to said antennas A1, ..., AM, respectively; wherein said signals are proportional to the components of a linear combination of said estimated eigenvectors.

10. The transmitter of claim 9, wherein:

(a) said channel analyzer operable to compare the magnitudes of a first eigenvalue and a second eigenvalue; and

(b) said signal generator allocates bits to be transmitted between first signals S'1, ..., S'M and second signals S"1, ..., S"M according to the results of step (a), wherein said first signals S'1, ..., S'M are transmitted according to the components of said first eigenvector and said second signals S"1, ..., S"M are transmitted according to the components of said second eigenvector and the signals S1, ..., SM include the sums S'1 + S"1, ..., S'M + S"M, respectively.

11. The transmitter of claim 9, wherein:

(a) when said communication channel connects said antennas A1, ..., AM with antennas B1, ..., BN of a receiver for N a positive integer, said M x M matrix is CC^H where C is an M x N matrix with element m,n an estimate of a channel coefficient from antenna Am to antenna Bn, and where C^H is the Hermitian conjugate of C.

12. The transmitter of claim 9, wherein:

(a) said signal generator includes information of constellation distributions and linear combinations of eigenvectors in terms of eigenvalues.